

THE SECOND BENHS EXPEDITION TO BELIZE, APRIL–MAY 1997

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The second BENHS expedition to Belize departed from the UK on 28 April 1997, returning on 18 May. The six-person team consisted of PW (leader) and the above authors (Fig. 1). The broad objectives and techniques were the same as for the first expedition in January–February 1996 and are listed and illustrated in the previous expedition report (Waring *et al.* 1996). The first expedition was timed for the end of the rainy season. This one was timed to coincide with the dark phase of the moon at the start of the rains.

SITE DETAILS AND SAMPLING PROGRAMME

Moths and butterflies were collected and recorded at four sites in the north and central parts of Belize, as detailed below:

1. Pook's Hill, near Belmopan, Cayo District (17°09'N 88°51'W):

The main base of the 1996 expedition, Tamandua Farm near the village of St Margarets in the centre of Belize, was not available for this expedition but a similar base was found at Pook's Hill (Fig. 2 and Map 1), just west of Belmopan. Like Tamandua Farm, Pook's Hill is in the foothills of the Mayan Mountains and is surrounded by a similar type of vegetation, which can be described as neotropical moist broadleaved forest. Smith (1996) gives an extensive list of the tree species present, as found on the Tapir Mountain Nature Reserve, against which the boundary of the Pook's Hill property abuts. The trees in the forest surrounding the camp at Pook's Hill were mostly 15–30 m tall. Figure 2 shows the proximity of the camp to the forest. The camp is on a limestone terrae overlooking the forest to the east and with forest above it to the west. We were based at Pook's Hill from 29 April–5 May, returned for the night of 7 May and from 12–16 May. During this time we operated one 6 W actinic light trap on the edge of the camp overlooking the forest and another within the forest on a game trail. We also operated a 160 W mercury vapour bulb all night in front of the white wall of one of the cabins in the camp, hanging the bulb from under the eaves in case of rain (Fig. 3). It was, therefore, only visible from the side overlooking the forest and not from above. In addition, up to ten bait traps were operated night and day in the forest, including two traps made of white netting as well as others of black.

2. Las Cuevas Research Station, Chiquibul Forest, Cayo District (16°44'N 88°59'W):

From 5–7 May four of us (PW, JF, GF & PH) moved operations to a field research station at Las Cuevas in the Chiquibul Forest (Fig. 4). The station was built by the Natural History Museum, London (BMNH) in cooperation with the British Army and the Belizean Government. For the past three years it has been providing the opportunity for researchers from Belize and other countries to undertake studies of the forest and its wildlife. The station is set in one of the largest remaining tracts of broadleaved forest in Belize. All the forests in Belize have a history of disturbance.



Fig. 1: The expedition members: L-R Graham Finch, Jim Fox, Pat Haynes, Barry Fox and Anona Finch (Paul Waring behind camera).



Fig. 2: Pook's Hill Lodge, the base camp, with views over the forests of the Tapir Mountain National Park



Map 1



Fig. 3: MV light in operation under eaves of white-walled cabin at Pook's Hill



Fig. 5: MV light and sheet in operation at Las Cuevas Field Station



Fig. 4: Las Cuevas Field Station in the Chiquibul Forest



Fig. 6: MV light with Nissen hut as back drop at Las Cuevas Field Station

Hurricane Hattie in 1961 flattened large areas of the Chiquibul Forest, leaving many broken stems. Over the next 35 years a dense pole forest has developed and this was selectively logged up to 1983 (J. Howell, *pers. comm.*). If most of the trees are not that old, it is also important to remember that the forests themselves have been extensively disturbed by humans. The Mayan population was large and widely distributed up to 1100 AD with most of the present forest areas having large buildings and other Mayan artifacts within them. Much of the forest around these must have been cleared to grow crops. From 1500 AD there was a British presence

and logging for export. The standing forest also experiences natural fires on a comparatively frequent basis because Belize is a convergence zone with great fluctuations around the average climate. About one year in five is markedly drier than the norm and fires then run through the tracts of coniferous forest. About one year in twenty-five, or four times a century, there is a very dry year when fires even enter the broadleaved forest. Lightning strikes may initiate such fires but nowadays man is the most likely cause. The Belizean forests such as Chiquibul, and their wildlife, must have been relatively dynamic and subject to local change for many centuries.

Consequently the trees are not as tall as in parts of South America. 80 m trees are rare and the forest does not have the stratification of canopy structure of primary and mature secondary forest and may lack the organisms which are extreme specialists of such habitat. Nevertheless the forest is known to support a wide range of forest birds and mammals including the Jaguar *Panthera onca* and Baird's Tapir *Tapirus bairdii*. While we were there a party of eighteen Scarlet Macaws *Ara macao* were frequent visitors to the trees around the camp. This bird is now very rare in Central America generally, as a result of hunting and habitat destruction. Las Cuevas appears to be the only site in Belize where the species is regularly seen.

The research station is situated on limestone with a river some 4.5 miles away as the only surface water, so mosquitoes and other biting insects with aquatic immature stages are relatively infrequent compared with many other places in Belize.

The station is in a rectangular clearing in the forest and contains several buildings (Figs 4–6). The edges of the clearing are some 50 m from the central dormitory and laboratory building. Two 160 W blended MV bulbs were operated on these edges, on cables from the central building. One of the bulbs was set up on a small tree from which we hung a vertical sheet (Fig. 5); the other used the outer-facing end of a Nissen hut as a backdrop (Fig. 6). These lights were supplemented by two 6 W actinic light traps, one on the east edge of the clearing and the other on the forest trail leading to the river and known as the Monkey-tail Trail.

3. Tapir Mountain National Park, adjacent to Pook's Hill, Cayo District, (17°09'N 88°51'W):

While four members of the expedition were at Las Cuevas, the remaining two (AF & BF) operated two actinic traps and several bait traps within the boundary of the Tapir Mountain National Park abutting Pook's Hill. This was at the request of, and by arrangement with, our hosts at Pook's Hill and the Belize Audubon Society, who are keen to obtain an inventory of the species present on the reserve. The habitat and situation in which the traps were operated closely resembled the forest site for the actinic trap at Pook's Hill, from which they were only a few hundred metres distant and effectively sampling the same habitat.

4. La Milpa research station, Rio Bravo Conservation and Management Area (Programme for Belize), Orange Walk District (17°50'N 89°01'W):

This site (Fig. 7) was visited for two nights during the 1996 expedition. We were pleased to be able to continue work on this site, staying for four nights, during which we found a quite different range of moths and butterfly species from the first visit.

Four actinic traps were operated, two on the edges of the clearing around the camp (north and south edges) and two along the forest road leading to the nearby Mayan ruins. Mains electricity from the camp generator was only available from



Fig. 7: La Milpa research station in the Rio Bravo Special Conservation Area



Fig. 8: White and black bait traps in operation on forest track at La Milpa

dusk until 22.00 hrs so two MV bulbs were operated until this time, one over a vertical sheet on a cabin balcony facing the forest to the west, the other over a vertical sheet on our dormitory balcony facing the forest to the north. At 22.00 hrs the dormitory MV bulb was replaced by a much less energy-demanding 6 W actinic tube on battery power for the rest of the night. The cabin site ceased operation at 22.00 hrs. Thirteen bait traps were operated along the forest road (Fig. 8).

RESULTS

This paper reports the species of butterflies (Rhopalocera) and birds seen during the expedition, as well as including some notes on other vertebrates recorded. Work to identify and tabulate the hawk-moths (Sphingidae), emperor moths (Saturniidae), tiger moths (Arctiidae) and other families of moths is well advanced and will be published in future papers. Some of the general observations on the moths are included here. We encountered many more moths per night per light at all sites than on the 1996 expedition. At Pook's Hill and Las Cuevas the catches included a wide range of hawk-moths and emperor moths which dominated the other moths in both size and numbers. At Pook's Hill we recorded 38 species of hawk-moths in the first four nights and had twenty-two species to one MV light in one night near the end of the expedition (13/14 May). We inspected the catches at intervals from dusk (18.30 hrs) up to 22.00 hrs and then again at dawn (05.00 hrs). Many moths were collected up as they arrived, and at dawn we attempted to collect at least one representative of each species of macro-moth so that we could construct a full species list. We counted the total catch and the numbers of each species of sphingid and saturniid. The entire catch of moths at each actinic trap was collected and the insects of other orders which entered the traps were recorded.

It quickly became evident that several sphingid species began to arrive at the lights as soon as it became dark, with species added gradually through the night. The sphingid *Emmorpha satellita* L. (Fig. 9) was the most numerous species, with as many as ten individuals at the MV light at Pook's Hill by 22.00 hrs on the first nights of the expedition. In contrast, the great majority of the saturniid species had not arrived by 22.00 hrs, only *Automeris moloneyi* Druce being a regular exception by arriving 30 minutes or so earlier. Fig. 10 shows the sphingid and saturniid species in a pre-22.00 hrs catch at Pook's Hill compared with those arriving between 22.00 hrs and dawn of the same night. Particularly frequent and impressive in size and wing patterns in the catches were *Rhesezyntis hippodamia* Cramer (which we also recorded in January 1996—in the forest at Tamandua Farm, Fig. 4 in Waring *et al.* 1996), *Dysdaemonia borens* Cramer, *Caio championi* Druce and *Eacles imperialis* Drury (Figs 11–13).

Virtually all the moths were in very fresh condition—some still releasing meconium. As the expedition progressed, many species became more numerous, indicating that we were at the beginning of the emergence period. This had been our plan in that the first rains after the dry season are known to trigger mass emergences and late April and May is normally the start of the wet season in Belize. In fact there had been two days of intermittent light rain at Pook's Hill on the two days before our arrival. There had also been some rain at Las Cuevas before we arrived there and the emergence of moths was at least as advanced as at Pook's Hill. In contrast, Jan Meerman at Georgeville, only 10 miles from Pook's Hill but in open drier habitat, had had no rain and was getting very few moths nightly to his actinic light. Similarly, at Rio Bravo, in the drier north of Belize, there had been little if any rain and hawk-moths were few and far between. The *Citheronia* species of emperor moths and allies



Fig. 9: *Eumorphia satellita* Linn., the most numerous sphingid species at Pook's Hill, with as many as ten individuals at the MV light per night



Fig. 11: *Dysdaemonia boreus* Cramer (Saturniidae) at rest in eaves by MV light



Fig. 10: Sphingid and saturniid species in a pre-22.00 hrs catch at Pook's Hill (left-hand box) compared with those arriving between 22.00 hrs and dawn of the same night (right-hand box).



Fig. 12: *Caio championi* Druce (Saturniidae) at rest in eaves by MV light



Fig. 13: *Eacles imperialis* Drury (Saturniidae) at rest by MV light



Fig. 14: Swallowtail butterflies *Eurytides philolaus* (Boisduval) imbibing salts on the banks of the River Macal amongst which there were also a few of the white *Eurytides epidaus* (Doubleday).

were also notably absent. However, *E. imperialis* was well on the wing, along with both *Rothschildia lebeau* (Guérin-Ménéville) and *R. roxana* Schaus.

Butterflies seen on the wing by day were generally less numerous than on the previous expedition at Tamandua Farm in January–February 1996. Fresh emergences were only just underway and there was a relative lack of nectar sources to attract butterflies into view. We did not see the distinctive *Heliconius erato* Doubleday at all this time, though it was frequent on the first expedition, but several other heliconiid species were on the wing which we had not seen previously. Several other butterfly species seen on the first expedition were also notable by their absence. The bait traps produced new species on a steady basis however, and by the end of the expedition we had recorded nearly 60 species of butterflies (Appendix 1), rather more than on the first expedition. It was particularly pleasing to see swarms of the black and blue Swallowtail butterfly *Eurytides philolaus* (Boisduval) imbibing salts on the banks of the River Macal south of San Luis, en route to Las Cuevas. We encountered a group of about 300 there at 14.00 hrs on 5 May (Fig. 14), amongst which there were about ten of the white *Eurytides epidaus* (Doubleday).

Other wildlife was also recorded including just over 200 species of birds (Appendix 2). Particularly noteworthy sightings included the party of eighteen Scarlet Macaws at Las Cuevas, which was active in the trees around the research station throughout our stay. A Jabiru Stork *Jabiru mycteria* was seen at Crooked Tree Nature Reserve on the return journey from Rio Bravo. It was eating a snake out on the baked mud flats by the lagoon. An Emerald Toucanet *Aulacorhynchus prasinus* had a nest in a dead tree by the camp at Pook's Hill and it was often seen



Fig. 15: Patrick Warrior (far left) and Jan Meerman (centre) examining some of the papered specimens with Barry Fox, Paul Waring and Anona Finch.



Fig. 16: Open air lecture by Pat Haynes at La Milpa research station

looking out of the nest-hole, especially at hot times of the day and when it heard activity near the nest. Like the Scarlet Macaws, the Jabiru Stork is also a scarce bird, with two pairs nesting at the Crooked Tree reserve, possibly the only remaining breeding site in Central America. The Emerald Toucanet is an uncommon forest species.

Noteworthy sightings of other vertebrates included: nine-banded armadillo *Dasytus novemcinctus* on a forest path at Pook's Hill, seen by Graham at 15.15 hrs one afternoon soon after our arrival in Belize; white-nosed coati mundi *Nasua narica*, at Las Cuevas, a group of eight or nine were encountered by Graham on the afternoon of 6 May; Yucatan black howler monkeys *Alouatta pigra*, a troop of about eight individuals, watched in the tree-tops by all of us between 15.30 and 16.30 hrs on 10 May at the Mayan ruins at Las Milpas; Central American spider monkeys *Ateles geoffroyi*, seen within a hundred metres of the howler monkeys at the same time and place. Both these and the howlers included mothers with small infants. Some of the spider monkeys approached us and shook leafy branches at us from their positions in the tree canopy; neotropical river otter *Lutra longicaudis* at Crooked Tree Nature Reserve, seen by all of us at 10.00 hrs on 12 May, swimming in the lagoon and periodically raising up out of the water to look around; tayra *Eira barbara* at Pook's Hill, seen by Paul at 09.20 hrs on 14 May, disturbed in the top of a cahoun palm tree, it climbed agilely from tree to tree, clucking as it moved off and causing palm leaves to crash down. This mustelid has a characteristic yellow head with otherwise blackish brown fur over the body and the long bushy tail of this individual was black; jumping viper *Atropoides uniuuifer* at Las Cuevas, seen by Paul, Jim and Graham just before dusk coiled up at rest in a lair on the forest floor; brown racer snake *Dryadophis uelauolouuus* at Pook's Hill, seen by Barry at 09.00 hrs on 14 May in the forest; boa constrictor *Boa coustrictor*, 2 m in length, at Pook's Hill, seen by Barry at 10.30 hrs on 14 May crossing a game trail in the forest while Barry was inspecting our bait traps;

Contrary to some expectations, snakes were infrequently encountered on this expedition. Only three species, the poisonous fer-de-lance *Bothrops asper*, the non-venomous tropical rat-snake *Spilotes pullatus* and an unidentified but harmless brown water-snake were seen at Tamandua on the first expedition, and these once or twice only, with a boa constrictor at Lubaantun. The water-snake was a regular bath companion, creeping about over the floor of the stream I washed in at Tamandua, but it is not listed for Belize in Garel & Matola (1995).

ACTIVITIES AND MEETINGS WITH RESIDENTS AND VISITORS TO BELIZE

During the expedition we were keen to meet up with other individuals who were interested in the wildlife of Belize. We spoke with the staff at each place we stayed and explained our techniques and objectives. We visited Jan Meerman at his home and research centre at Georgeville. Jan has lived and worked in Belize for nearly a decade, during which he has recorded butterflies, hawk-moths and saturniids and built up considerable experience with these taxa. His help with identifications has been most useful and we were able to share with him our records and findings up to that point, some of which he has been able to incorporate in his forthcoming publications. Jan also visited us at Pook's Hill, along with local tour guide Patrick Warrior, and we were able to demonstrate our methods and examine more of the collected material together (Fig. 15). At La Milpa research station the expedition was invited to give a brief presentation on our activities to a group of visiting students

and this included an open air lecture by Pat Haynes (Fig. 16). We also visited Belize Zoo, which is providing the focus for various conservation and education initiatives in Belize. By visiting Belize more than once, we have been able to develop continuing relationships with various organisations and individuals and to build on the preparation and fieldwork of the first expedition. Preliminary lists of species have been supplied to the appropriate contacts among those listed below, together with photographs of identified set specimens, to assist and develop local interest in the Lepidoptera, which is currently hampered by the lack of identification guides. As an indication of the interest the expeditions have generated, Vicki Snaddon at Pook's Hill has collected and sent monthly samples of moths to us, using equipment we have left with her in Belize, and Barry Fox has been back to Pook's Hill to do further recording. All of this is helping to build up knowledge of seasonality and distribution for a broad range of lepidopteran families, some of which have hardly been studied before in Belize and about which little is known in Central America generally.

CIRCULATION OF THIS EXPEDITION REPORT

Belize Forestry Department; Belize Zoo; Pook's Hill Lodge; Programme for Belize (La Milpa Field Station, Belize City office and Valerie Giles); the Belize Audubon Society; Las Cuevas Field Station; the Natural History Museum, London; the Spang family, Seven Hills; Ray Harberd, Fallen Stones Butterfly Ranch; Belize Foundation for Research and Environmental Education (BFREE).

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REFERENCES

- D'Abbrera, B., 1986. *Sphingidae Mundi. Hawk moths of the World*. Classey. Faringdon.
 D'Abbrera, B., 1995. *Saturniidae Mundi. Saturniid moths of the World. Part 1*. Automeris Press. Keltern. Germany.
 DeVries, P.J., 1987. *The butterflies of Costa Rica and their natural history*. Princeton University Press. Oxford.
 Garel, T. & Matola, S., 1995. *A field guide to the snakes of Belize*. Belize Zoo & Tropical Education Centre. Belize.
 Howell, S.N.G. & Webb, S., 1995. *A guide to the birds of Mexico and northern Central America*. Oxford University Press. Oxford.
 Matola, S., 1995, revised 1998. *The ABC's to the vegetation of Belize—a handbook*. Belize Zoo & Tropical Education Centre. Belize City.

- Programme for Belize, 1996. *The plants of the Rio Bravo Conservation and Management Area*. Annotated Species List. Programme for Belize.
- Reid, F., 1997. *A field guide to the mammals of Central America and southeast Mexico*. Oxford University Press. Oxford.
- Smith, A., 1996. *Tapir Mountain Nature Reserve and tropical forests conservation manual*. Belize Audubon Society. Belize City.
- Waring, P., Collins, G. & Spalding, A., 1996. The BENHS expedition to Belize, January–February 1996. *British Journal of Entomology & Natural History* 9: 197–203.

APPENDIX 1

Butterflies in Belize: BENHS expedition 30 April–16 May 1997

Localities: Pook's Hill (PH) Tapir Mtn (TM) La Milpa (LM) Las Cuevas (LC)

PAPILIONIDAE: Papilioninae: *Parides sesostris xestos* (Gray) TM, *P. arcas mylotes* (Bates) PH, *P. iphidamas iphidamas* (Fab.) PH, *P. lycimenes lycimenes* (Boisduval) PH, *Battus belus chalceus* (Roths. & Jordan) TM, *Eurytides philolaus* (Boisduval) PH, LC, *E. epidaus epidaus* (Doubleday) PH

PIERIDAE: Pierinae: *Daptoueura (Melete) isandra* (Boisduval) PH; Coliadinae: *Phoebis seunae marcellina* (Cramer) PH, LM, *Eurena दौरा दौरा* (Godart) PH, LM, *E. proterpia* (Fab.) PH +

NYMPHALIDAE: Charaxinae: *Prepona oniphale octavia* Fruh. LM, *Archaeoprepona demophou centralis* Fruhstorfer PH TM LM; *A. demophon gulina* Fruh. TM, LC; *A. atuphimachus* (Fab.) PH TM, *Fountainea (Memphis) eurypyle confusa* (Hall) PH; *Meuphis morvus boisduvali* (Comstock) PH; *M. forreri* (Godman & Salvin) LM
 Nymphalinae: *Colobura dirce dirce* (L.) PH TM; *Tigridia aesta* (L.) PH; *Historis odius orion* (Fab.) PH TM LM; *H. acheronta acheronta* (Fab.) LM; *Hauadryas ferouia farinulenta* (Fruh.) PH; *H. februa fereutiua* (Godart) PH; *Dyuamine mylitta* (Cramer) PH; *Marpesia petreus* (Cramer) PH LM; *Pyrrhogyra ueaerea hypseuor* G. & S. PH; *Catouephile mexicana* Jenkins & de la Maza PH LC; *Nessaea aglaura* (Doubleday) PH; *Callicore patelina* (Hewitson) PH; *Anartia fatina* (Fab.) PH; *A. jatrophae* (Linn.) PH LM; *Mestra amymone* Menetries LM; *Adelpha iphichus* (L.) TM; *Chlosyne jauais* (Drury) PH; *C. gaudealis* (Bates) PH; *Tegosa guatemalena* (Bates) PH

Heliconiinae: *Heliconius charitouia charitouia* (L.) PH, LM; *H. ismenius* (Latreille) PH

Danainae: *Danaus gilippus gilippus* (Cramer) LM

Ithomiinae: *Tithorea harmonia hippothous* G. & S. PH; *Mechatitis lysimnia* (Fab.) PH; *Aeria euriuedia pacifica* G. & S. PH; *Oleria paula* (Weymer) PH

Morphinae: *Morpho peleides* Kollar PH

Brassolinae: *Opsiphanes quiteria quirinus* G. & S. PH LC; *O. cassina fabricii* (Boisduval) TM; *Caligo mennon mennon* (Felder) TM; *C. eurilochus sulatus* Fruh. PH; *C. uranus* (H.-S.) PH

Satyrinae: *Pierella luna heracles* (Boisd.) TM; *Taygetis mermeria* Cramer PH TM; *T. virgilia rufomarginata* Staud. PH; *T. zizuri* Butler PH; *Euptychia (Cissia) usitata* (Butler) PH; *E. metaleuca* (Boisduval) PH LM; *E. confusa* (Staudinger), LC

LYCAENIDAE: Theclinae: *Eumaeus toxea* (Godart) LM.

APPENDIX 2

Birds in Belize: BENHS expedition 30 April–16 May 1997

RS = road side; PH = Pook's Hill; LC = Las Cuevas; LM = La Milpa; CT = Crooked Tree

Great Tinamou (*Tinamus major*) PH LC. Slatey-breasted Tinamou (*Crypturellus boucardi*) PH. Neotropic Cormorant (*Phalacrocorax brasilianus*) PH LM CT. Magnificent Frigatebird (*Fregata magnificens*) RS. Great Blue Heron (*Ardea herodias*) CT. Great Egret (*Egretta alba egretta*) PH LM CT. Snowy Egret (*Egretta thula*) RS CT. Tricoloured Heron (*Egretta tricolor*) RS CT. Cattle Egret (*Bubulcus i. ibis*) PH LM CT. Yellow-crowned Night Heron (*Nycticorax violacens*) CT. White Ibis (*Endocinus albus*) RS. Glossy Ibis (*Plegadis falcinellus*) RS. Jabiru (*Jabiru mycteria*) CT. Black-bellied Whistling-Duck (*Dendrocygna autumnalis*) CT. Masked Duck (*Oxyura j. jamaicensis*) CT. Black Vulture (*Coragyps atratus*) RS PH LC LM CT. Turkey Vulture (*Cathartes aura*) RS PH LM CT. King Vulture (*Sarcoranplus papa*) PH LM. Osprey (*Pandion haliaetus*) CT. Swallow-tailed Kite (*Elanoides forficatus*) PH LC. White-tailed Kite (*Elanus leucurus majusculus*) LM. Snail Kite (*Rostrhamus sociabilis*) LM. Plumbeous Kite (*Ictinia plumbea*) PH LC. Northern Harrier (*Circus cyaneus hudsonius*) LM. White Hawk (*Leucopternis albicollis*) PH LM. Common Black Hawk (*Buteogallus anthracinus*) PH. Grey Hawk (*Buteo nitidus*) LM. Roadside Hawk (*Buteo magnirostris*) LM. Ornate Hawk-Eagle (*Spizeatus ornatus vicarins*) LM. Laughing Falcon (*Herpetotheres cachinnans*) PH. Barred Forest-Falcon (*Micrastur ruficollis*) LM. Bat Falcon (*Falco rufignularis*) PH. Plain Chachalaca (*Ortalis vetula*) PH LM. Crested Guan (*Penelope p. purpurascens*) LM. Ocellated Turkey (*Meleagris ocellata*) LC LM. Spotted Wood-Quail (*Odontophorus guttatus*) LM. Grey-necked Wood-Rail (*Aramides cajanea*) CT. American Coot (*Fulica a. americana*) CT. Limpkin (*Aramus guarana dolosus*) LM CT. Black-necked Stilt (*Himantopus ni. mexicanus*) CT. American Avocet (*Recurvirostra americana*) LM. Northern Jacana (*Jacana s. spinosa*) LM. Spotted Sandpiper (*Actitis macularia*) PH. White-rumped Sandpiper (*Calidris fuscicollis*) CT. Pectoral Sandpiper (*Calidris melanotos*) CT. Laughing Gull (*Larus atricilla*) RS CT. Bonaparte's Gull (*Larus philadelphia*) CT. Ring-Billed Gull (*Larus delawarensis*) CT. Least Tern (*Sterna antillarum*) CT. Pale-vented Pigeon (*Columba cayennensis pallidicrissa*) PH. Scaled Pigeon (*Columba speciosa*) LM. Red-billed Pigeon (*Columba flavirostris*) PH LM. White-winged Dove (*Zenaidura asiatica*) LM. Mourning Dove (*Zenaidura macroura*) PH. Plain-breasted Ground-Dove (*Columbina minuta interrupta*) PH LM. Ruddy Ground-Dove (*Columbina talpacoti*) RS PH LC LM. Blue Ground-Dove (*Claravis pretiosa*) PH LC. White-tipped Dove (*Leptotila verreauxi*) LM. Grey-headed Dove (*Leptotila p. plumbeiceps*) PH. Aztec Parakeet (*Aratinga astec*) PH LC LM. Scarlet Macaw (*Ara macao*) LC. White-crowned Parrot (*Pionus senilis*) PH. White-fronted Parrot (*Amazona albifrons*) PH LM. Red-lored Parrot (*Amazona a. autumnalis*) PH LC. Mcaley Parrot (*Amazona farinosa*) PH. Yellow-headed Parrot (*Amazona oratrix*) PH. Squirrel Cuckoo (*Piaya cayana*) PH LC. Groove-billed Ani (*Crotophaga sulcirostris*) PH LC LM. Vermiculated Screech Owl (*Otus guatemalae*) PH. Spectacled Owl (*Pulsatrix perspicillata saturata*) PH. Central American Pygmy-Owl (*Glaucidium griseiceps*) PH. Lesser Night-Hawk (*Chordeiles acutipennis*) LM. Common Night-Hawk (*Chordeiles minor*) PH LC. Pauraque (*Nyctidromus albicollis*) PH LM. White-collared Swift (*Streptoprocne zonaris*) PH. Vaux's Swift (*Chaetura vauxi*) PH LM. Lesser Swallow-tailed Swift (*Panyptila cayennensis*) PH. Long-tailed Hermit (*Phaethornis superciliosus*) PH. Little Hermit (*Pygmornis longuemareus*) PH.

White-necked Jacobin (*Florisuga m. mellivora*) PH. Green-breasted Mango (*Anthracothorax prevostii*) LM. Canivet's Emerald (*Chlorostilbon canivetii*) PH. White-bellied Emerald (*Amazilia candida*) PH. Rufous-tailed Hummingbird (*Amazilia t. tzacatl*) PH. LM Purple-crowned Fairy (*Heliothryx barroti*) LM. Black-headed Trogon (*Trogon m. melanocephalus*) PH. Violaceous Trogon (*Trogon violaceus braccatus*) PH LC LM. Collared Trogon (*Trogon collaris*) PH LM. Slatey-tailed Trogon (*Trogon m. massena*) PH. Tody Motmot (*Hylomanes momotula*) PH. Ringed Kingfisher (*Ceryle t. torquata*) CT. Amazon Kingfisher (*Chloroceryle amazona mexicana*) PH. Green Kingfisher (*Chloroceryle americana*) PH. Pygmy Kingfisher (*Chloroceryle aenea stictoptera*) PH. White-whiskered Puffbird (*Malacoptila panamensis inornata*) PH LM. Rufous-tailed Jacamar (*Galbula ruficauda melanogenia*) PH. Emerald Toucanet (*Aulacorhynchus prasinus*) PH. Collared Aracari (*Pteroglossus torquatus*) PH LM. Keel-billed Toucan (*Ramphastos sulfuratus*) PH LC LM. Acorn Woodpecker (*Melanerpes formicivorus*) LC. Black-cheeked Woodpecker (*Centurus pucherani perileucus*) PH. Golden-fronted Woodpecker (*Centurus aurifrons*) PH. Smoky-brown Woodpecker (*Veniliornis fumigatus*) PH LM. Chestnut-coloured Woodpecker (*Ceelus castaneus*) PH. Lineated Woodpecker (*Dryocopus lineatus*) PH. Pale-billed Woodpecker (*Caupeplilus guatemalensis*) PH LM. Buff-throated Foliage-Gleaner (*Automolus ochrolaemus*) PH LC. Plain Xenops (*Xenops minutus mexicanus*) PH LC LM. Tawny-winged Woodcreeper (*Dendrocincla anabatina*) LM. Ruddy Woodcreeper (*Dendrocincla l. homochroa*) LM. Olivaceous Woodcreeper (*Sittasomus griseicapillus*) LM. Wedge-billed Woodcreeper (*Glyphorhynchus spirurus pectorali*) PH. Barred Woodcreeper (*Dendrocolaptes certhia*) LM. Ivory-billed Woodcreeper (*Xiphorhynchus flavigaster*) PH LC. Great Antshrike (*Taraba major melanocrissa*) PH. Barred Antshrike (*Thamnophilus doliatus*) PH LC LM. Dot-winged Antwren (*Microrhoptias quixensis*) PH LM. Dusky Antbird (*Cercomacra tyrannina crepera*) PH LC. Mexican Antthrush (*Formicarius monoliger*) PH LC LM. Northern Beardless Tyrannul (*Camptostoma imberbe*) LM. Greenish Elaenia (*Myopagis viridicata*) PH LM. Ochre-bellied Flycatcher (*Mionectes oleaginus assimilis*) PH. Sepia-capped Flycatcher (*Leptopogon amaurocephalus pileatus*) LM. Northern Bentbill (*Oncostoma cinereigulare*) LM. Common Tody-Flycatcher (*Todirostrum cinereum*) PH. Eye-ringed Flatbill (*Rhynchocyclus breverostris*) LM. Yellow-olive Flycatcher (*Tolmomyias sulphurescens cinerei*) PH. Royal Flycatcher (*Onchorhynchus coronatus mexicanus*) PH LM. Ruddy-tailed Flycatcher (*Terentricus erythrurus fulvignus*) PH Sulphur-rumped Flycatcher (*Myiobius s. sulphureipygius*) PH LM. Olive-sided Flycatcher (*Contopus borealis*) PH. Tropical Pewee (*Contopus cinereus*) PH. Yellow-bellied Flycatcher (*Empidonax flaviventris*) PH LM. Black Phoebe (*Sayornis nigricans*) PH. Vermilion Flycatcher (*Pyrocephalus rubinus*) PH. Bright-rumped Attila (*Attila spadiceus*) LM. Dusky-capped Flycatcher (*Myiarchus tuberculifer*) PH. Great-crested Flycatcher (*Myiarchus crinitus*) LM. Brown-crested Flycatcher (*Myiarchus tyrannulus*) PH. Great Kiskadee (*Pitangus sulphuratus*) PH. Boat-billed Flycatcher (*Megarhynchus pitangua*) PH LM. Social Flycatcher (*Myiozetetes similis*) PH LM. Sulphur-bellied Flycatcher (*Myiodynastes luteiventris*) PH LM. Tropical Kingbird (*Tyrannus melancholicus*) PH LM. Eastern Kingbird (*Tyrannus tyrannus*) PH LM. Fork-tailed Flycatcher (*Tyrannus savana monachus*) LM. Thrushlike Mourner (*Schiffornis turdinus veraepacis*) LM. Masked Tityra (*Tityra semifasciata*) PH LM. Black-crowned Tityra (*Tityra inquisitor fraserii*) PH LM. White-collared Manakin (*Manacus caudei*) PH. Red-capped Manakin (*Pipra m. mentalis*) PH LM. Grey-breasted Martin (*Progne chalybea*) LM. Mangrove Swallow (*Tachycineta a. albilinea*) RS. Northern Rough-winged Swallow (*Stelgidopteryx serripennis*) LM. Bank Swallow (*Riparia r. riparia*) LM. Brown Jay

(*Cyanocorax morio*) PH LC LM. Band-backed Wren (*Campylorhynchus zonatus*) PH. Spot-breasted Wren (*Thryothorus maculipectus*) PH LM. Plain Wren (*Thryothorus m. modestus*) PH. Southern House Wren (*Troglodytes aedon*) RS PH. White-breasted Wood-Wren (*Heinicorhina leucosticta*) PH. Long-billed Gnatwren (*Ramphocaenus melanurus*) LM. Blue-grey Gnatcatcher (*Polioptila caerulea*) PH. Tropical Gnatcatcher (*Polioptila plumbea brodkorbi*) PH. Veery (*Catharus fuscescens*) LM. Clay-colored Robin (*Turdus grayi*) PH LC LM. Grey Catbird (*Dumetella carolinensis*) RS. Tropical Mockingbird (*Mimus gilvus*) RS LM. Red-eyed Vireo (*Vireo olivaceus*) LM. Tawny-crowned Greenlet (*Hylophilus o. ochraceiceps*) PH LM. Lesser Greenlet (*Hylophilus d. decurtatus*) LM. Chestnut-sided Warbler (*Dendroica peusylvanica*) PH. Magnolia Warbler (*Dendroica magnolia*) PH. Black-and-white Warbler (*Mniotilta varia*) PH LM. American Redstart (*Setophaga ruticilla*) PH LM. Ovenbird (*Seiurus aurocapillus*) PH. Northern Waterthrush (*Seiurus noveboracensis*) PH LM. Common Yellowthroat (*Geothlypis trichas*) PH. Golden-crowned Warbler (*Basileuterus culicivorus*) LM. Bananaquit (*Coereba flaveola*) PH. Golden-hooded Tanager (*Tangara larvata*) PH. Red-legged Honeycreeper (*Cyanerpes cyaneus caruiceps*) PH LM. Scrub Euphonia (*Enphonia affinis*) LM. Yellow-throated Euphonia (*Enphonia hirundinacea*) PH LC. Olive-backed Euphonia (*Euphonia g. gouldi*) PH LM. Blue-grey Tanager (*Thraupis episcopus cana*) PH LM. Yellow-winged Tanager (*Thraupis abbas*) PH LC LM. Grey-headed Tanager (*Eucometis penicillata pallida*) PH LM. Black-throated Shrike-Tanager (*Lanio aurantius*) LM. Red-crowned Ant-Tanager (*Habia rubica*) LM. Red-throated Ant-Tanager (*Habia fuscicauda*) PH LM. Hepatic Tanager (*Piranga flava*) PH. Crimson-collared Tanager (*Phlogothraupis s. sanguinolenta*) PH. Scarlet-rumped Tanager (*Ramphocelus p. passerinii*) PH. Greyish Saltator (*Saltator coerulescens*) PH. Buff-throated Saltator (*Saltator maximus*) PH. Black-headed Saltator (*Saltator atriceps*) PH LM. Black-faced Grosbeak (*Caryothraustes p. poligaster*) PH LM. Northern Cardinal (*Cardinalis cardinalis*) LM. Blue-black Grosbeak (*Cyanocompsa cyanooides concreta*) PH LM. Blue Bunting (*Cyanocompsa parellina*) LC LM. Orange-billed Sparrow (*Arremon aurantirostris*) PH. Olive Sparrow (*Arremonops rufivirgatus*) PH LM. Blue-black Grassquit (*Volatinia jacarina spendens*) LC LM. Variable Seedeater (*Sporophila aurita corvina*) PH. White-collared Seedeater (*Sporophila torqueola*) PH LC LM. Yellow-faced Grassquit (*Tiaris olivacea*) PH LC. Chipping Sparrow (*Spizella passerina*) RS. Red-winged Blackbird (*Agelaius phoeniceus*) CT. Eastern Meadowlark (*Sturnella magna*) LM. Melodious Blackbird (*Dives dives*) PH LC. Great-tailed Grackle (*Quiscalus mexicanus*) RS PH LC. Bronze Cowbird (*Molothrus aeneus*) LM. Giant Cowbird (*Scaphidura oryzivora impacifica*) LM. Black-cowled Oriole (*Icterus dominicensis prothemela*) PH LM. Yellow-tailed Oriole (*Icterus m. mesomelas*) PH. Baltimore Oriole (*Icterus galbula*) PH. Yellow-billed Caciue (*Amblycercus h. holosericens*) PH. Chestnut-headed Oropendola (*Psarocolinus w. wagleri*) PH. Montezuma's Oropendola (*Psarocolinus montezuma*) PH.